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ABSTRACT

This specification covers the components of electronic and electromechanical equipment, nonelectronic materials for the teacher-student positions, and other items of a miscellaneous nature to provide for a complete and workable language laboratory facility. Language laboratory facilities covered by this specification are of two types: (1) listening/speaking/monitoring (listen-respond) and (2) listening/speaking/monitoring/recording/intercommunicating (listening/respond/record). (Author)

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STANDARD SPECIFICATION FOR LANGUAGE LABORATORY

EA 003 812

ED057435

SPECIFICATION
FOR
LANGUAGE LABORATORY

(This Specification has been approved by the Standardization Committee for the use of all State Agencies.)

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PART I

INSTRUCTIONS FOR THE USE OF SPECIFICATIONS

I. DEFINITIONS

A. Purchaser - The State Agency, Institution, or School unit that is procuring the installation.

B. Buyer - The representative or the staff of the Purchase and Contract Division handling the bid and award procedure.

C. Bidder - The person, partnership, company, or corporation offering a proposal. Following award of a contract the term bidder refers to the successful bidder.

D. Inspector - The representative of the Engineering Section of the Purchase and Contract Division responsible for conducting the following inspections:

Preliminary, conditional acceptance, and/or acceptance inspection.

II. SPECIAL INSTRUCTIONS TO SCHOOL UNITS

As a service to those school units considering the purchase of a language laboratory the Division of Instructional Services, Department of Public Instruction, has issued a publication entitled "The Language Laboratory - Suggestions for North Carolina Schools". It is strongly recommended that the guidelines contained in this publication be followed. Particular attention is invited to that portion of page 7 which reads as follows:

> "It is now generally believed that the most suitable type of laboratory for a secondary school is one in which at least three-quarters of the positions are of the listen-respond type and not more than one-quarter of the listen-respond-record type."

III. INFORMATION TO BE PROVIDED BY THE PURCHASER WHEN SUBMITTING REQUISITION

A. State the type of system desired, that is, whether Type I or Type II.

B. State total number of student positions.

C. If Type I, state if intercom mode is desired.

D. State the number and kind of master source channels desired in the console. (Refer to specifications, page 13, sub-paragraph a for choice)

E. State if Monitor information is to be recorded at the console when so selected by the instructor.

Instructions for the Use of Specifications (Continued)

F. The requisition must be accompanied by a sketch or drawing on at least 8½" x 1 paper, prepared to scale, showing the space or area in which the laboratory is to be installed, the desired location of the console and the number and arrangement of student positions. See accompanying sample. Show the location and characteristics of an available power source. This should be 110-120 volt, 60 cycle, single phase alternating current. State if line voltage wiring from an external source to within the room is to be a part of the installation price or if this wiring is to be done locally. If provided locally it is recommended that a minimum of two 15 or 20 ampere circuits be made available at or near the console location. Show on the sketch the extent of any existing conduit or raceway between the console and the student positions, including the location of all outlets. If such in-the-room raceways are to be included in the installation, this should be so stated. The sketch should further show any anticipated future expansion.

G. State preference for earphone and microphone arrangement at the console, that is, whether separate items or combination. If separate state preference for microphone mounting - table stand or lavalier.

H. State if student booths are to be included or made locally. If included, state whether convertible or fixed type. If fixed type, is glass or solid front desired. Also state height of wing wall (choice of 48 to 53 inches).

I. If Type II, state number of student positions to be provided with record capability (25% recommended).

J. State if student recorders are to be single or dual track. Also, state if volume unit meters are desired.

K. State preference for earphone and microphone arrangement at student positions, that is, whether separate items or combination.

L. State which and how many spare components and accessories are desired. Refer to specifications, page 22, Article VII for choice.

IV. INSTRUCTIONS FOR THE BUYER IN PREPARING PROPOSALS

In addition to the information supplied by the purchaser under III above, the following information should be included in the Request for Bids.

A. State whether samples are required. Samples will include the essential units and components, that is, tape recorder-playback unit, record player, amplifier pre-amplifier, sample of each type switch - toggle and/or rotary, microphone, and earphone.

B. Require bidders to fill in time for making installation. State that this time will be an essence of the contract.

C. Make provision for bidders to offer a separate alternate price for dynamic typ microphone in lieu of crystal type included in base bid. (When separate units are requisitioned.)

Instructions for the Use of Specifications (Continued)

D. Make provision for bidders to offer a separate alternate price for ceramic type microphone in lieu of crystal type included in base bid.

E. Make provision for bidders to offer an alternate price for dynamic type earphone in lieu of crystal type included in base bid.

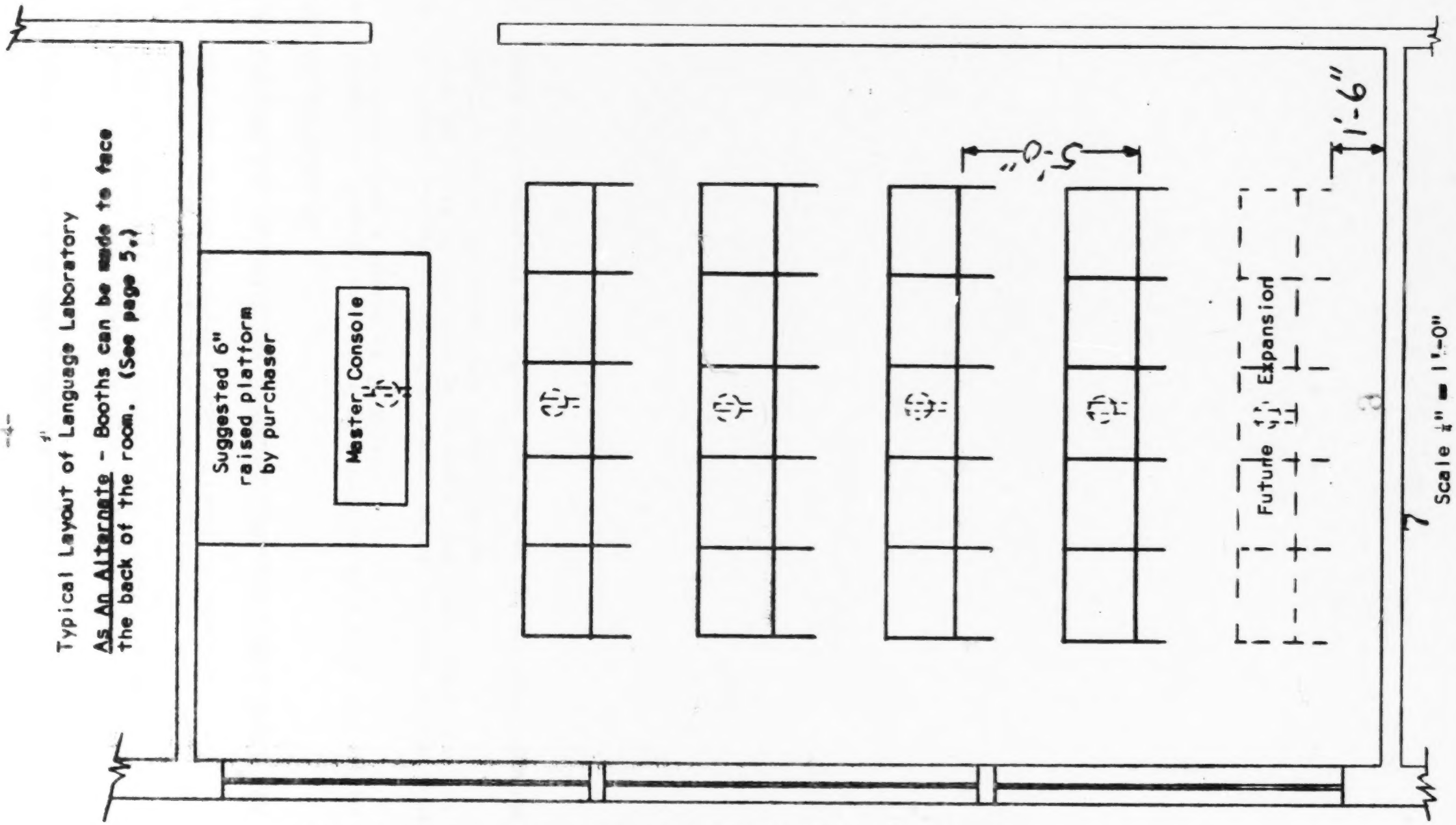
V. INSTRUCTIONS FOR THE INSPECTOR IN MAKING FINAL ACCEPTANCE INSPECTION OF THE INSTALLATION

A. Acceptance inspections should be scheduled only after the system has been in service for a period of 30 days.

B. For installations in secondary school units, arrange to have a representative from the staff of the Foreign Language Consultant, Department of Public Instruction in the acceptance inspection party.

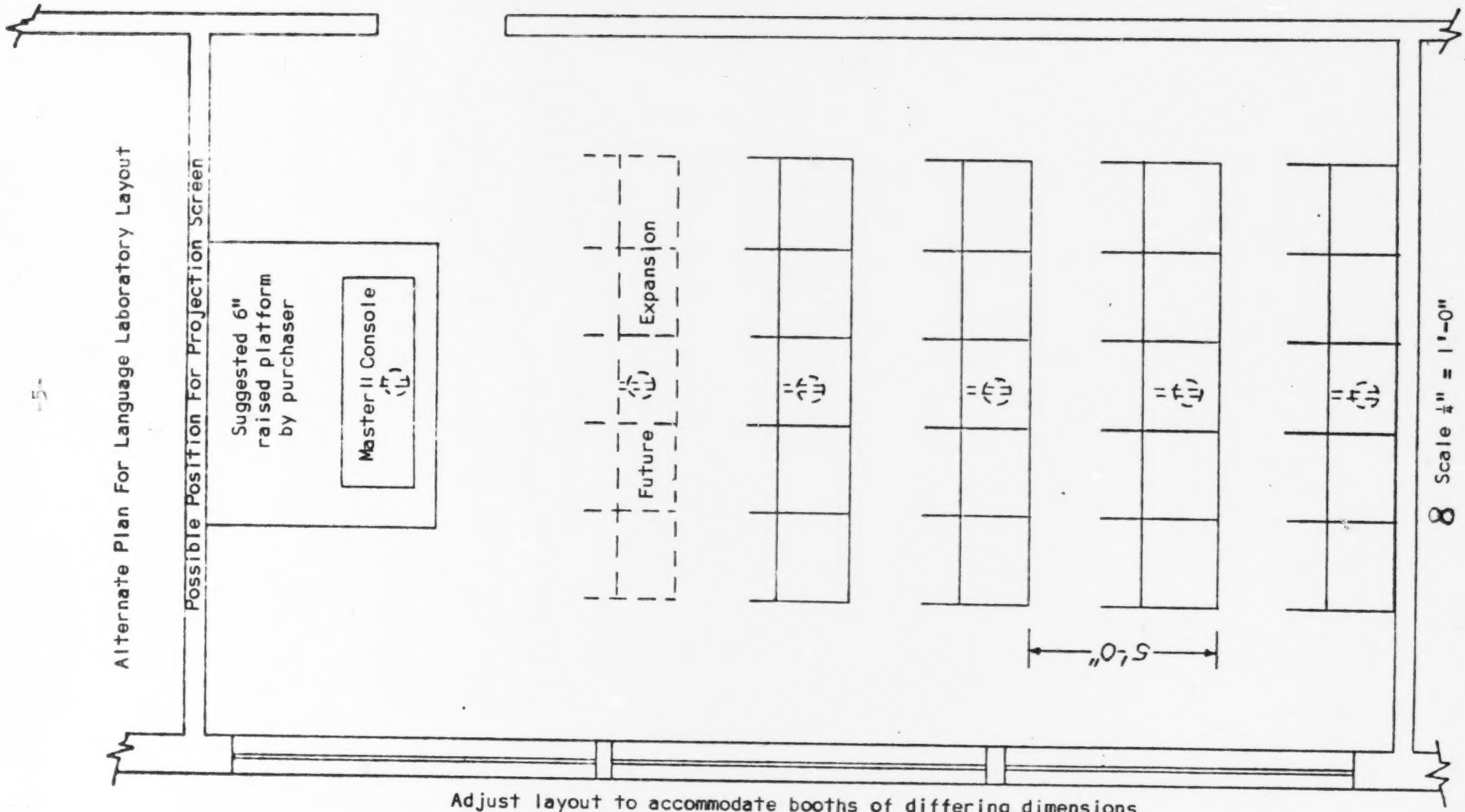
C. Check all components for proper functioning and for specification compliance.

A.C. line voltage to the console should be four (4) fifteen ampere 117 V. circuits for distribution to console and booths.


Typical Layout of Language Laboratory
As An Alternate - Booths can be made to face the back of the room. (See page 5.)
Suggested 6" raised platform by purchaser
Master Console
5'-0"
1'-6"
Future Expansion
Scale ¼" = 1'-0"

Adjust layout to accommodate booths of differing dimensions or to fit room area.

A.C. line voltage to the console should be four (4) fifteen ampere 117 V. circuits for distribution to console and booths.



Adjust layout to accommodate booths of differing dimensions or to fit room area.

SPECIFICATION

I. SCOPE

This specification is intended to cover the components of electronic and electro-mechanical equipment, non-electronic materials for the teacher-student positions, and other items of a miscellaneous nature to provide for a complete workable Language Laboratory facility. It is not intended to cover items incidental to the operation of the equipment or the instructional process, such as room alterations or repairs, acoustical treatment, room furniture, instructional material and supplies, et cetera.

II. CLASSIFICATION

Language Laboratory facilities covered by this specification are classified as follows:

Type I - Listening - Speaking - Monitoring (Listen-Respond)

Type II - Listening - Speaking - Monitoring - Recording - Intercommunicating (Listen-Respond-Record)

The purpose of the Type I System is to provide for practice in hearing and imitating the spoken language and to enable the student to hear himself objectively. Provision is to be included for enabling the instructor to listen in (Monitor) from the console. Instruction is from the instructor position (Console), on two or more channels, to student positions. The following equipment is under the control of the student:

1. Earphones through which the student listens.
2. A volume control by which the student adjusts the volume of the sound source.
3. A microphone used to permit the student to hear his own voice amplified in the earphones as he responds.

When stated in the invitation for bids, provisions shall be included in the Type I System for enabling the instructor and the student to communicate with each other individually. This function is automatically a part of the Type II System.

The purpose of the Type II System is the same as that stated for the Type I System, plus the addition of a tape recorder-playback unit in the student position. This enables the student not only to hear himself, but also to compare himself with a master recording, thus affording the opportunity of

correcting and improving his performance. This system will also permit the student to practice individually throughout the period of the class. In making his own individual tape recordings, the student records his own responses to the master tape for later playback and comparison.

The Type II System shall perform at least the following functions at the student position:

1. To record lesson material coming from the program source.
2. To record student's own voice while he is responding either to the voice directly from the program source or from a recording of it.
3. To playback appropriate sections of the tape so the student may hear the original recording followed by his own responses.

When stated in the invitation for bids the Type II System shall have the additional student functional capability of re-recording over his previous response without effecting the recording of the program source.

The Type I System should be arranged for expansion - at a future date - to include the functions of a Type II System with a minimum of effort and expense. This implies that the initial wiring shall include sufficient cable for all present and future distribution needs. It further implies that student position amplifiers furnished at the time of installation of the Type I System be a type providing audio-active (Listen-Respond) capability only, but which can be replaced with amplifiers incorporating the Record (Compare) capability if and when the expansion occurs.

III. APPLICABLE REFERENCES

The following applicable references in effect on the date of the invitation for bids forms a part of this specification:

A. Electronic Industries Association's Standards and Specifications
B. National Electric Code
C. Underwriters' Laboratories Standards
D. NEMA Standard LP-2

IV. GENERAL REQUIREMENTS

A. CONTRACTUAL CONDITIONS

1. Proposals invited under these specifications shall be on a fully installed basis, that is, all equipment assembled, set in position, connected and placed in successful operation - a turnkey job.

2. Line voltage wiring (AC) is separated into two categories:

   a. External AC supply wiring, or that wiring required to provide an AC source to the room or space in which the laboratory facility is to be installed and connected. This wiring is generally terminated at or near the instructor's console.

b. Local AC supply wiring or that line voltage wiring required within the room or space. This wiring connects at the terminal point under (a) above and extends through the instructor's console to the student positions.

When stated in the invitation for bids the external wiring defined under (a) above may be by others. When included in the bid such wiring shall be in accordance with Supplementary Requirements for Line Voltage Source Wiring, Appendix A to this specification. Under either category of purchase, the successful bidder shall be responsible for making all connections and placing the facility in successful operation.

3. Each bidder shall submit with his proposal the following information:

a. Name and address of the manufacturer of the complete facility.

b. Name, identifying model or figure number and performance ratings of components including:

(1) Console tape recorder playback units
(2) Student tape recorder playback units
(3) Record (disk) player
(4) Record (disk) player amplifier
(5) Console record playback amplifiers
(6) Student record playback amplifiers
(7) Student audio active amplifiers
(8) Any pre-amplifiers
(9) Intercom and/or monitor amplifiers
(10) Earphones
(11) Microhpones
(12) Detailed layout drawing of the console and student booth arrangement to a scale of not less than one inch to the foot or in lieu an enlarged photograph will be acceptable. Arrangement is interpreted to mean the location of major components, switches, instruments and controls, including all markings.

c. A parts list of sub-components (capacitors, resistors, transistors, tubes, etc.) which distinguishes between standard parts or those readily available from electronics parts dealers - and parts of proprietory design, available only from the manufacturer.

d. A listing including value ratings of any components or sub-components of foreign manufacture.

e. The manufacturer's specifications of the overall facility.

f. A wiring diagram of a typical facility installation indicating proper installation techniques as well as method and materials for interconnecting the various component parts.

g. A schematic diagram of each major component.

h. A listing including name, address and phone number of qualified trained technicians in the full time employment of the Bidder who will make the installation and provide service through the period of warranty.

4. The successful Bidder will be required to submit to the purchaser - prior to release of any payment - three (3) sets of the following:

   a. Operating and maintenance instructions

   b. The parts list submitted with the bid - as specified under (c) above

   c. An accurate schematic diagram of each component to facilitate diagnosis of circuit and component malfunction, part(s) replacement, as well as circuit and mechanical adjustment.

   d. A detailed wiring diagram of the final installation to indicate wire location, the location of junctions, connections made at junctions, the type of connectors, wire coding, and any other data considered essential for efficient service.

5. At the request of the Purchase and Contract Division, the Bidder shall submit for inspection such samples as may be requested. Samples shall be submitted within ten (10) days following the request. Failure to comply with this request may be considered grounds for disqualifying a bid.

6. To receive consideration an individual, company, or corporation submitting a bid will be required to show evidence that he can meet at least one of the following qualifications:

   a. That the Bidder is the assembler of all major components of the system and the system carries the name of the assembler.

   b. That the Bidder is the manufacturer of the major components of the system.

   c. That the Bidder is the authorized representative of the assembler of the system as stipulated under (a) above, or is the authorized representative of the manufacturer of the major components of the system as stipulated under (b) above.

   d. That the Bidder is a combination of assembler and manufacturer. Under this qualification the Bidder must show evidence that the major components being incorporated into the system is with the full knowledge and consent of the manufacturer of such units and that the manufacturer warrants his equipment for the intended use.

   (Major components are interpreted to mean tape recorder-playback units, record players, pre-amplifiers and amplifiers.)

Bidders defined under (a), (c), and (d) above will be further required to submit to the Purchase and Contract Division written acknowledgment from the manufacturer of the major components that their warranty is extended directly to the State of North Carolina and the purchaser, an authorized State Agency.

7. The Bidder, as qualified above, shall have in service, for a period of not less than nine (9) months, an approved installation similar to the type systems offered. Proof of such experience shall be in the form of a listing submitted with the bid showing the location where installed and the date of the installation.

8. The purchaser reserves the right to withhold final payment for equipment furnished and services rendered by the successful bidder in the performance of work under these specifications until thirty (30) calendar days shall have elapsed, during which operation shall have included full and satisfactory implementation of all specified functions of all equipment, and performance at least according to the minimum standards set forth in these specifications as certified by the purchaser's technical consultant. The last day of this thirty (30) day period shall be considered the official inspection date.

9. The Bidder shall have access to or maintain an adequate and continuous inventory of repair parts. He shall further be able to render necessary service and repairs by trained employees both until the official inspection date as determined in (8) above, and for a period of twelve (12) months thereafter. Such service shall be furnished within twenty-four (24) hours after an authorized service request. Before the official completion date, such service, parts replacement, and labor shall be furnished without cost, except in cases of obvious vandalism. For one calendar year thereafter such service, parts replacement, and labor shall continue to be furnished without cost except: (a) in cases of obvious vandalism, and (b) in cases of trivial service requests due to failure of teaching personnel to understand the operation of the equipment.

10. <u>Insurance and Liquidated Damages</u>

    a. The Bidder shall take out and maintain during the life of this contract all of the insurance required under Section XVII of the attached Form R-1, "The General Contract Terms and Conditions". Proof of such insurance shall be in the form of certificates issued in duplicate to the Purchase and Contract Division by the successful bidder, promptly upon receipt of the purchase order.

    b. The time required for the installation shall be filled in the space provided on the proposal form. The date for the commencement of the time stated shall be five (5) days after the mailing of the official purchase order, unless stated otherwise, and shall end upon official acceptance of the installation.

    c. For each day in excess of the number of days stated and within the limitations stipulated that are required to complete the installation, the bidder shall pay to the owner the sum of Twenty-Five Dollars ($25.00) per day as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the owner by reason of failure of the bidder to complete the work within the time stated; such time being in the essence of the contract and a material consideration thereof. The liquidated damages will be figured on a work day basis, that is, five work days per normal work week.

d. If the Bidder should be delayed at any time in the progress of the work by an act or neglect on the part of the purchaser, or any of his representatives, or by changes ordered in the work, or by strike, lock outs, fires, unusual delay in transportation, unavoidable casualties, or other causes beyond the control of the bidder, then the time of completion will be extended for such period as is considered reasonable by the Division of Purchase and Contract with agreement of the purchaser.

e. The Bidder shall notify the purchaser and the Division of Purchase and Contract, in writing, of any requests made for extension of time within 10 days following occurence of the cause for delay and the Division will determine if the delay is to be granted.

11. Performance Bond

a. The successful Bidder shall furnish a Performance Bond executed by a surety company authorized to do business in North Carolina. Performance Bond shall be in the amount of the full contract price. Bond shall be executed on the form bound with these specifications.

b. All bonds shall be countersigned by an authorized agent of the Bonding Company who is licensed to do business in North Carolina.

c. Sufficient copies of the Bond Form will be supplied the successful Bidder for distribution of executed copies to the surety, his own file, the purchaser, and the Division of Purchase and Contract.

12. The original manufacturer of the equipment must provide the Guarantee or Warranty, including installation and maintenance, which is offered by distributors or agents of his equipment.

13. The Bidder shall advise the purchaser in setting up a suitable preventative maintenance program.

14. The successful Bidder shall sponsor, as soon as the language laboratory is ready for regular student use, a program of instruction by a qualified language laboratory specialist, acceptable to the purchaser, to all teachers and other personnel involved in the operation, maintenance, and administration of the laboratory. This program shall include the necessary minimum of group instruction plus a single check-out of each individual in the operation of all equipment. Include particular instruction to teachers in such details as proper microphone technique including the best talking distance for given voice and volume settings. On the day final payment falls due, as defined in Section 8, a follow-up period of instruction shall be conducted for the benefit of the same personnel.

B. SPECIAL CONDITIONS APPLYING TO ALL EQUIPMENT

1. All equipment shall be designed and constructed specifically for rigorous educational use and shall not be modified versions of home type units.

2. All components or units must emphasize modular or unit design and construction.

3. All amplifier modules, power supply modules, and other modules shall be easily removable and replaceable without the use of special tools and without the necessity of soldering.

4. No tube, transistor, condenser, or resistor anywhere in the system shall be operated in excess of the maximum ratings specified by the original parts manufacturer for the class of operation involved.

5. a. Extraneous noise, including hum, cross-talk, AC hash, frying noises, feedback under normal operating conditions, microphonics, and switching transients, should be inaudible at normal listening level. However, the manufacturer or installing firm shall not be held responsible for the existence of extraneous noise due to causes beyond his control such as interference from unshielded or unsuppressed electronic apparatus in the same building or nearby buildings, or from fluorescent lighting. The manufacturer or installing firm shall, however exercise all due care in seeking to predict and avoid such interference.

b. System Performance

(1) Definitions

(a) System - The language laboratory system shall be considered an entity exclusive of all accessory equipment, e.g. program sources, earphones, and voltage regulators. The system includes all electronic components, switching devices, and interface wiring between lowest level inputs and highest level outputs. Lowest level inputs will normally be found at microphone input connectors. The electronic characteristics of lowest level inputs do not require quantitative specification for the purpose of system performance measurements. Highest level outputs are found at any point in the normally operating system at which an earphone is connected, provided that, under any conditions of measurement, there shall be no stages of amplification following the designated "output" point. All system specifications shall be measured along the path of maximum amplification and switching.

(b) Normal Program-Line Operating Level - Normal program-line operating level is the signal level which will result in a reading of 0 db at the console VU meter.

(2) System Performance

(a) Frequency Response - Frequency response is the variation of gain as a function of frequency over the range specified and should be measured over the path of maximum gain (generally console microphone to student output). Measurement should also be made through other program, monitor and intercom lines. When measuring, signals of known characteristics shall be used for microphone and line inputs. The system response shall be no less than 100 - 7500 cps $\pm$ 3 db referred to 1000 cps, i.e., 0 db must correspond to output at 1000 cps. No peaks or valleys shall be present within the frequency range of 250 - 6000 cps which are greater than 1 db. (A peak is defined as an area of extra amplification

less than a quarter-octave wide. A valley shall be defined as an area of attenuation more than a quarter-octave wide. Peak record level is defined as that level at which the overall (input to output) total RMS harmonic distortion is 3% when measured on a 1000 cycle tone. Noise is measured when erasing a signal of peak record level, and in absence of a new signal. Thus, bias and erase noise are included, as well as playback amplifier noise. All components between 60 and 15,000 cps are measured.)

(b) Relative Levels - Volume levels of program, intercom, and monitor modes shall not vary by more than ± 3 db, referred to normal program line level at any earphone output in the system, under any conditions of operation.

(c) Signal-To-Noise - Noise level in the system includes hum, AC hash, frying noises, feedback, microphonics and crosstalk. This noise shall be at least 40 db below normal program-line level on all program, intercom, and monitor lines throughout the system. When measuring either signal-to-noise ratio or crosstalk, the signal-carrying line shall be energized to normal operating level, using a signal generator of known characteristics. One of these characteristics must be an internal noise level of at least 45 db. When measuring crosstalk, the signal-carrying line shall be energized to normal operating level as described above while the other line shall not be energized. Both lines shall be terminated into their normal operating impedance.

6. All individual components must be readily accessible for servicing.

7. The headbands on earphones, and cords and plugs furnished with earphones and microphones, shall be designed to withstand the rigors of institutional use. Written evidence shall be furnished that these items have a good service record. If the items proposed are a new development, furnish a description of the testing procedures used by the manufacturer to establish their durability. All earphones shall be readily adjustable to fit user's head and shall remain firmly adjusted while in use.

8. Control knobs on volume controls and switches shall be either double set-screw types, or equivalent types designed for trouble-free operation. Equivalent types must be approved by the Engineering Section of Purchase and Contract Division.

9. Preference shall be given to volume controls which incorporate special features designed to increase ruggedness and reliability.

10. It shall be impossible to cause breakage or spillage of tape through manual operation of tape recorder controls.

11. The system shall be so designed that, at a satisfactory volume in any mode of operation (record, playback, listen, intercom, monitor), switching to another mode will not cause disturbing changes in volume.

12. The system output circuitry shall be such that the output level does not vary more than 3 db from no load to full load.

13. Impedance and compatibility considerations shall be observed in accordance with the basic design of the complete system, and in accordance with approved engineering practices.

14. All recorders must be approved by the North Carolina Purchase and Contract Testing Laboratories.

    a. They will be tested by North Carolina Test Procedure NCTP(E)-11. These tests are similar to Retma REC-134 and SE-101-A.

    b. Data will be kept in the files of the Engineering Section, showing that the recorder will be consistent with the system integrity.

    c. A copy of U.L. file card will also be on record indicating that the recorder is under current approval of U. L.

C. <u>INSTALLATION</u>

1. All work in connection with the installation is to be performed by experienced skilled workmen under the supervision of a factory trained representative of the equipment manufacturer. All work shall be done at such time as to least interfere with the normal operations occurring within the immediate and adjacent areas and shall further be coordinated with any others doing work in the building who might be concerned with this installation.

2. Upon receipt of notice of award of the contract, the bidder will be allowed a period of _____ consecutive calendar days for compieting the installation. The installation shall include delivering and uncrating, assembling and securing in place, and complete electronic and power wiring including all connections as required to place the system in satisfactory operation. All components shall match electronically as well as mechanically with each other to form a properly functioning network.

3. All work shall be done in a professional and workmanlike manner, in accordance with good construction and engineering practices. This is intended to refer particularly to the smaller details necessary for a workmanlike job and not specifically mentioned including all those details peculiar to a language laboratory.

4. <u>Line Voltage Wiring</u>

    a. All line voltage wiring shall be done by a licensed electrical contractor in accordance with applicable requirements of the latest edition of the National Electric Code.

    b. When stated in the invitation for bids, the bid price shall include the necessary raceways between the instructor's console and the student positions. This shall be galvanized or sherardized conduit or similar metallic tubing, with runs made as inconspicuously as possible and thoroughly secured with matching one hole or U clamps. Runs of conduit or other raceway along floor surfaces should be avoided wherever possible. The bidder shall obtain approval of the

purchaser of proposed conduit and raceway layout and runs prior to proceeding with the installation.

c. All AC wire shall be solid copper thermoplastic insulated for 600 volts, color coded, and of proper size to carry the load within allowable voltage drop limitations but in no event shall such wire be smaller than No. 14 AWG.

d. A positive and separate equipment ground wire shall be extended and connected to each and every item. This to be in addition to the system ground.

e. Lateral runs of AC wire in each row shall be in raceway with an individual NEMA grounding type receptacle at each student position. To prevent student tampering no wiring will be exposed.

f. An AC master switch shall be provided at the console to remove all power from the equipment. If the external source wiring terminates with a service panelboard at or within easy reach of the console, as specified under the Supplementary Requirements for Line Voltage Source Wiring, Appendix A to these specifications, the circuit breakers in the panel-board will satisfy this requirement.

5. Audio Wiring

a. Audio or low voltage wiring shall be run in a separate conduit or raceway from line voltage wiring.

b. Audio wire may be either polypropylene or vinyl jacketed with tinned solid copper conductors, cabled. Wire to be of proper size to carry the load within reasonable temperature rise limits but in no case smaller than #22 AWG. Where high impedance circuitry is used all wire shall be shielded and drained with a tinned copper wire.

c. Distribution lines shall terminate, at both console and student positions, in readily accessible barrier strips or other suitable junction hardware, to permit efficient trouble-shooting. All connections to be made using tinned terminal lugs fully soldered or mechanically bonded to each conductor.

d. Line terminations shall be identified by labeling of barrier strips, or by a chart which identifies color-coded lines.

e. Vertical runs of audio wiring at each row of student booths shall be enclosed in conduit or raceway.

f. Lateral runs of audio wiring at student positions may be concealed in the booth construction, provided they are bundled and laced together with continuous cord lacing.

6. The fitting of equipment, devices, controls, instruments, etc., into the console and student booths must be done in a neat, secure and finished manner. Rows of student booths shall be designated alphabetically commencing with the letter "A" on the row nearest the console and progressing away from the console. This lettering will be placed where directed. Individual booths within rows shall be numbered from left to right when

facing the room from the console position commencing with the number "1" and progressing numerically. Both letters and numbers shall be posted in a conspicuous location, fully visible and legible from the console position.

D. FUNCTIONS

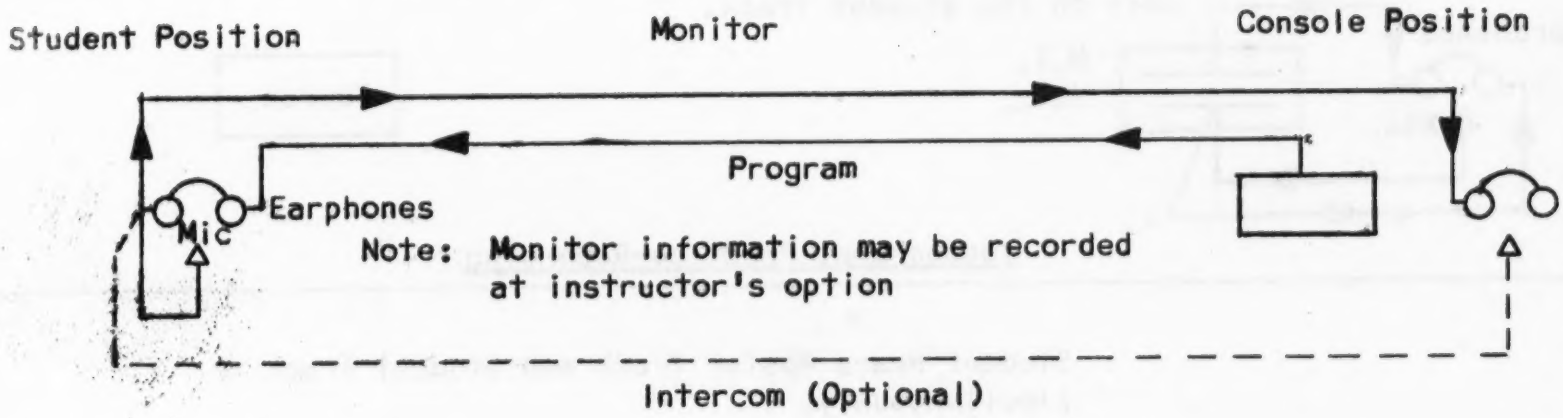
1. The Type I System provides the functions of Listen, Respond, and Monitor. When requested in the invitation for bids, the intercommunicating function may be included with the Type I System.

2. The Type II System provides the complete functions of Listen, Respond, Monitor, Record and Intercommunicating.

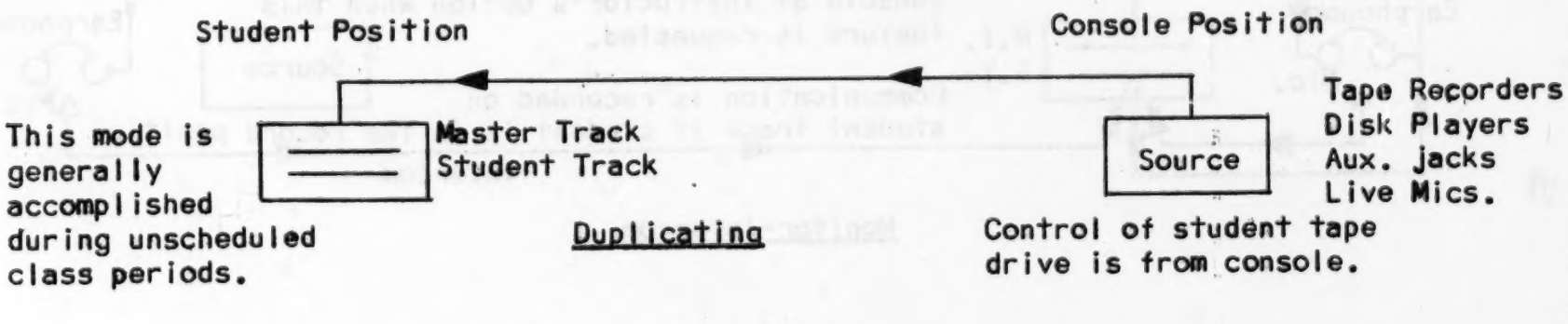
3. System functions capable with the Type I and II Systems are displayed graphically on the following sketches.

DIAGRAMMATIC SKETCHES OF SYSTEM FUNCTIONS

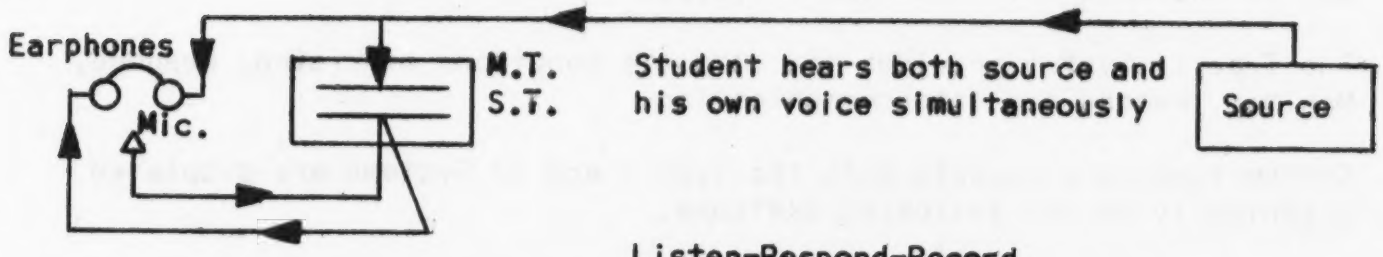
TYPE I LISTEN-RESPOND



TYPE II LISTEN-RESPOND-RECORD

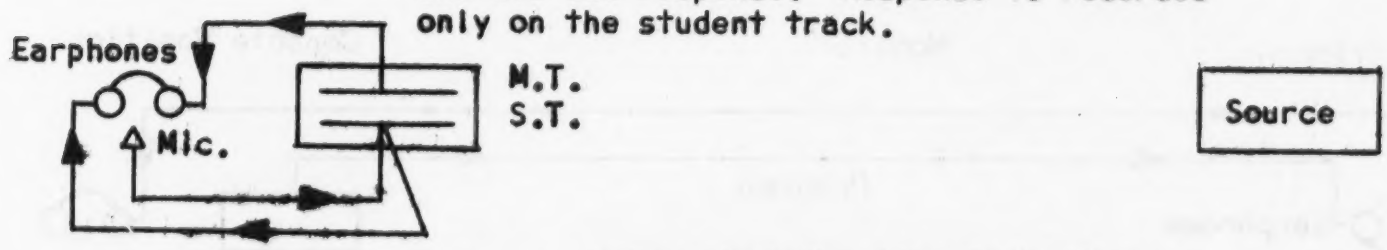


Note: Lesson is recorded on Master Track during scheduled class periods. Control of student drive may be at console or the student position.



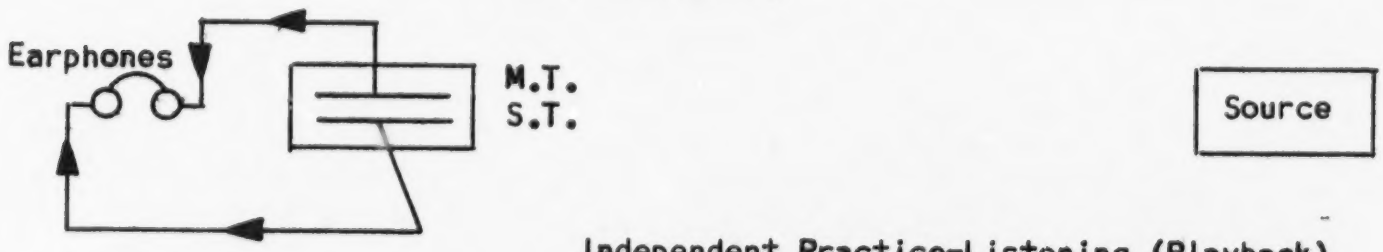
Listen-Respond-Record

Student hears pre-recorded (duplicated) Master Track or Master Track recorded during lesson and his own response. Response is recorded only on the student track.



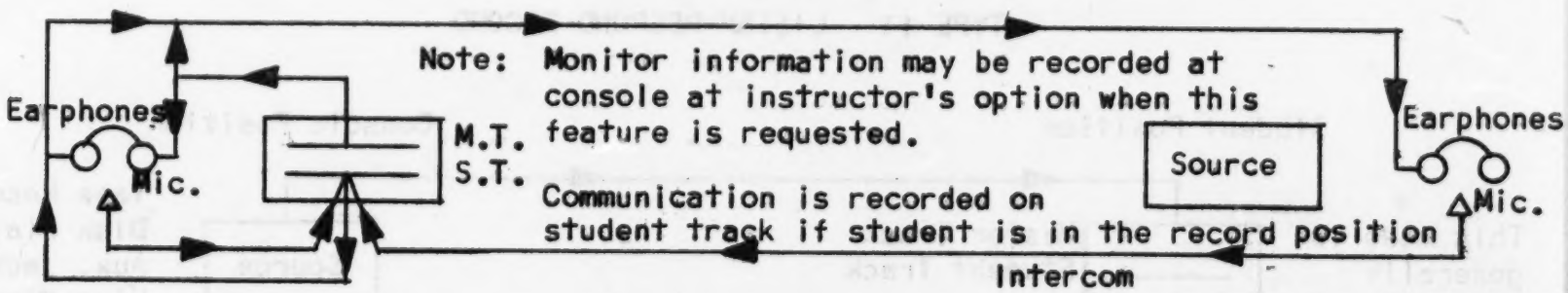
Independent Practice-Recording

Student hears Master Track and Student Track simultaneously.



Independent Practice-Listening (Playback)

Monitor (Instructor hears student undetected)



Monitor-Intercom

V. DETAILED REQUIREMENTS

A. INSTRUCTOR'S CONSOLE

1. The language laboratory shall contain a teacher's console with tape, disk, and auxiliary program sources and switching facilities to simultaneously distribute the lesson program sources to individual student positions. The auxiliary program sources to consist of two input jacks - one of which shall be a low-input type equipped with its own amplification for programming live mike, radio, TV receiver, telephone or similar sources of origin and the other of a high input type with no amplification programs originating from portable tape recorders, record players or similar sources containing its own amplification. The number of tape and disk program sources integral to the console shall be as stated in the invitation for bids.

2. The console shall be of the desk type with a clear writing top surface approximately 29 inches in height. Console equipment shall be so arranged that the instructor has a clear view of the room when seated. Space shall be provided in or on the console for the number of program sources as stated in the invitation for bids. All program sources shall preferably be accessible to the instructor for loading and unloading from a normal seated position. All amplifiers at the console shall be arranged in plug-in modules using appropriate molded connector, plugs and sockets for audio circuits or an acceptable equivalent arrangement. Amplifiers shall be clearly identified and mounted in accessible locations in keeping with good engineering practice particularly with reference to minimizing heat and hum pick-up from tape unit drive motors. The design shall provide for proper ventilation of the electronic and the electro-mechanical components. A vertical panel at the rear of the console shall be provided to permit access to the equipment mounted in the console. The console may be constructed of metal or wood.

If the console is constructed of wood, the material shall be a kiln-dried hardwood normally used in furniture manufacture such as clear solid maple, birch, etc. If plywood is used, it shall be limited to panels, drawer bottoms, shelves, etc. Plywood shall be not less than 3/8 inches thick and where exposed, veneers shall be of clear matching hardwood. Console work surface may be plastic or solid wood. If plastic, it shall be 1/16 inch thick, Class 1, General Purpose Type Decorative Laminate meeting the requirements of NEMA Standard LP-2 of issue in effect at the time of bid. Such plastic shall be firmly adhered with a first quality adhesive made especially for the purpose, to a plywood or particle board top. <u>If particle board is used, the physical characteristics must receive prior approval of the buyer</u>. Tops shall be of not less than 1 inch nominal thickness and shall be supported or reinforced in such manner as to prevent warping. The color of the plastic shall blend with the color of the console. The console shall be of rugged and substantial build, well braced, using conventional jointing methods. A good grade of water resistant resin or animal glue shall be applied freely to tenons, dowels, and dovetails. Joints shall be further secured by concealed pins, pegs, screws, etc. All surfaces exposed to view shall be sanded smooth, cleaned and stained and finished with two coats of clear spar varnish.

If the console is constructed of metal, the material shall be sheet steel not less than 18 US gauge of a grade used in furniture manufacture. Legs may be either round or rectangular in cross section. If necessary, panel sheets shall be broken, braced or otherwise reinforced to eliminate cupping or buckling. Joints shall be welded, fully fusing joining metals. Field joints may be bolted. Such connections shall be made with bolts concealed and joints as neat and inconspicuous as possible. All edges, corners, and welds shall be ground smooth. The entire assembly shall be thoroughly cleaned and finished ready for delivery. The finish shall be baked enamel.

With either type of construction, legs shall be provided with suitable metal glides approximately 1 inch in diameter.

a. Equipment and Accessories

The console shall be furnished with all selected equipment prewired and pre-fitted at the factory. The program sources may consist of any combination of the following as stated in the invitation for bids:

(1) Two speed (3-3/4 and 7-1/2 ips) manual threading, single channel, half track, tape recorder-playback unit.

(2) Two speed (3-3/4 and 7-1/2 ips) manual threading, dual channel, half track, tape recorder-playback unit.

(3) Two speed (3-3/4 and 7-1/2 ips) manual threading, single channel, half track, playback only unit. (No Record or Erase Heads)

(4) Three speed (33-1/3, 45, and 78 rpm) manual record (disk) player.

(5) Single speed cassette two track recorder.

(6) Low level input jack.

(7) High level input jack.

Note: Record-Playback implies that the instructor will have the ability to copy or duplicate a purchased master tape or record at the console so the copy may be used as master source and the purchased item stored for safekeeping. The instructor shall also have the facility to produce his own master tapes for use as a source. Any necessary patch cords or jumpers required to accomplish this operation shall be furnished.

Dual channel is defined as the ability to record and/or playback on either or both tracks simultaneously and independently.

To accomplish the functional capabilities herein specified a control panel or panels shall be provided along with the following accessories:

(1) One microphone - arranged for table stand or lavalier mounting as stated in the proposal.

(2) One set of earphones.
(In lieu of separate microphone and earphone - a combination shall be furnished when so stated in the request for bids.)

b. Equipment Functions and Associated Controls

(1) Master switch to control the AC supply to all console equipment (See Section C. 4. (f) page 10).

(2) Tape recorder(s) shall be equipped with controls to implement the following functions: (a) AC on-off; (b) record-duplicate, recording from any other program source, from the console microphone, or from the intercom system; (c) playback; (d) rewind; (e) fast forward; (f) pause lever; (g) stop or "Tape out" switch. The pause lever or switch shall instantaneously stop the forward motion of the tape in the record-duplicate and playback modes, without turning off the electronics. A volume control shall regulate the record-duplicate volume. A resettable digital counter shall be provided on the tape mechanism to indicate tape position.

(3) A VU meter shall be included for each program source (channel) along with the necessary adjacent volume controls to permit proper adjustment of each channel, or a single professional VU meter 3" or larger with a Type B scale with single channel selector switch may be permissible.

(4) A positive-indication selector switch shall be used for the selection of program sources.

(5) Monitoring and intercom switches shall be arranged in rows, geographically oriented to the physical layout of student positions in the laboratory.

(6) Switching modes shall be provided to permit monitoring and intercommunication with (a) any individual student; (b) any row of students; (c) any combination of individuals and rows (program call); (d) the entire class at one time (all-call).

(7) Monitoring of individual students must be silent and undetectable by the monitored student, who must not hear any clicks, pops, or change of volume.

(8) Where applicable all switches shall be self-cleaning, with silver or gold-plated contacts.

(9) While instructor and selected student or students are communicating via intercom the program source shall be muted or cut-out completely.

(10) Booth switching shall be provided with row override.

(11) An extra earphone jack shall be provided for a guest listener.

(12) The control panel shall contain a student recorder switch or switches which shall permit simultaneous starting and stopping of all selected student tape recorders on the same channel.

(13) All components on the console shall be appropriately identified in clearly legible letters not less than 3/16 inch size. Switches shall not only indicate the "Off" position, but each individual position, if multi-position type. Student position switches shall be identified and correleated by numbers on the individual student booths, both as to row and position within the row. Each master channel source of instruction shall be numbered progressively starting with 1.

(14) Consideration shall be given to the physical arrangement of controls and switches as they relate to the overall functions of the equipment.

B. STUDENT POSITIONS

1. The invitation for bids will state the number of student positions to be included in the installation.

2. Student booths, if included as a part of the proposal, may be either convertible or fixed type as stated in the invitation for bids. They may be constructed of either metal or wood or a combination. The table top shall be lined with a plastic material same as that specified for use at the console. The fixed side walls shall be acoustically treated with a minimum of 1½ inch nominal thickness fiberous glass material with a density of not less than 1-1/2 lbs. per cubic foot and having a noise reduction coefficient of not less than .80, or a similar material producing the equivalent result. This material to be contained in a perforated metal liner. The side walls shall extend no less than 6 inches nor more than 12 inches behind the rear edge of the table. Booths shall be arranged to take best advantage of the space with leeway for future expansion if possible. They shall be built to the following approximate dimensions:

Floor to horizontal table surface - 29 inches.
Floor to top of raised front panel - 48 to 53 inches.
Floor to top of fixed side panels - 48 to 53 inches.
Inside width of horizontal table surface - 30 inches.
Inside depth of horizontal table surface - 21 inches.

If the booth is of the fixed type, the front shall be same material and height as the side walls, or when stated in the bid request may be lined with 1/4" safety sheet glass with the bottom edge of the glass of sufficient height to prevent contact with the back posts of a chair. All glass edges to be ground smooth.

Posts or legs shall be provided with at least 1 inch diameter metal glides. Metal angle clips shall be provided and secured to the floor, as well as the posts or legs.

As soon as practical, after receipt of the order, the successful bidder will submit shop drawings for the approval of the purchaser prior to fabricating the booths.

The materials and construction features for the booths and finish shall be the same as that specified for the console where applicable. In general, the finish of the booth shall match that of the console.

There shall be no sharp edges, burrs, or protruding screws on any part of the booths with which a person could come into contact in normal usage.

3. The following equipment shall be provided at the student position:

a. <u>For Type I System</u>

(1) 1 - Student amplifier
(2) 1 - Volume control
(3) 1 - set earphones } or combination
(4) 1 - Microphone }

b. <u>For Type II System</u>

(1) 1 - Single speed, dual channel tape recorder/playback unit. If reel to reel, to be manual-threading and include 3-3/4 ips.
(2) 1 - Matching amplifier
(3) 1 - Volume control
(4) 1 - Set earphones } or combination
(5) 1 - Microphone }

Student position microphones, when furnished separate from earphones, shall be mounted on rigid arms with an adjustable "ball and socket" swivel base, permitting up-down, side-to-side, rotary motion.

c. <u>Equipment functions and associated controls</u>:

(1) Each student, whether or not he has recording facility, shall be able to listen to any designated program source and while responding (or recording) hear his own voice amplified through his own earphone-microphone system.

(2) Tape recorders, in positions so equipped, shall provide switching modes to implement the following functions: (a) AC on-off; (b) listen-record-duplicate, recording from microphone or program source; (c) playback; (d) rewind; (e) fast forward; (f) preferably with pause lever; (g) stop or a tape out switch. The pause lever or switch shall instantaneously stop forward motion of the tape in the record-duplicate and playback positions, without turning off the electronics. A resettable digital counter shall be provided on the tape mechanism to indicate tape position.

(3) A meter indicating recording and duplicating level shall be provided when so stated in the request for bids or an approved automatic gain control circuit.

(4) The volume control shall adjust the volume of the program source or student recording as heard in the student's earphones.

(5) Consideration shall be given to the physical arrangement of controls and switches as they relate to the overall functions of the equipment.

d. The student recording, erasing, and master recording heads shall be so arranged that half of the tape is used as a student track and the other half as a master track. The student recording is to be on his own track only, and master recording head shall record only on the master track. No erasing head shall be provided on this track to eliminate the possibility of the student unintentionally erasing the master recording, unless control of such eraser is provided at the console only, and requires a separate positive action to operate. The student track shall be equipped with standard erasing facility. When the audio selector switch is in the listen-respond-record mode the student can listen to master information and record his response to what he has heard. Master information is interpreted to mean information being fed from any of the source channels at the console. With the control in the independent Practice-Listen (Playback) mode, the student can hear both the master information and his response directly. When the control is in the duplicate position the recorder will duplicate master information. In this mode the student loses control of the individual drive, which will be controlled remotely by the teacher from a switch or switches located in the control panel at the console. Student positions not selected at the console for duplication shall be unable to record.

Master information shall be recorded directly on the master track. Student responses shall be recorded on the student track only, regardless of the position of any controls.

The student recorder shall have jacks for student microphone, student earphone, and instructor monitor. If the recorder is mounted flush on the student work surface, a suitable protective enclosure for the underside of the equipment shall be provided. This protective enclosure to be opened for ventilation.

VI. COMPONENT PERFORMANCE SPECIFICATIONS

A. All equipment requiring line voltage connections shall be designed for operation on 110 volt, single phase, 60 cycle alternating current.

B. THE AMPLIFIER

Each Listen-Respond (audio-active) student position shall be provided with a mixer amplifier incorporating two inputs and two outputs. It is recognized that the total number of amplifiers is a function of total system design; however, preference is for a separate amplifier serving the intercom-monitor function.

1. Amplifier Performance

a. Input Sensitivity - 1 millivolt RMS (-60 db)

b. Frequency Response - 150 - 12,000 cps ± 1 db
75 - 12,000 cps ± 2 db
60 - 15,000 cps ± 3 db

c. Total Harmonic Distortion - Preferred - 2% at maximum output;
Acceptable, 2% at operating level.

d. Intermodulation Distortion - 2%, 60 - 6,000 cps, 4 to 1 ratio.

e. Signal to Noise Ratio - 55 db below 6 millivolt, without reference to maximum output.

Standard gainset and wave analyzer techniques shall be the basis for frequency response and harmonic distortion measurements respectively. (Reference - EIA Standard SE 101-A Amplifiers for Sound Equipment)

2. Tape Recorder Units - All recorders must be approved by the North Carolina State Purchase and Contract Testing Laboratories.

   a. They will be tested by North Carolina Test Procedure NCTP(E)-11. These tests are similar to Retma REC-134 and SE-101-A.

   b. Data will be kept in the files of the Engineering Section, showing that the recorder will be consistent with the system integrity.

   c. A copy of U.L. file card shall be submitted with bid indicating that the recorder is under current approval of U. L.

3. Record (Disk) Player

   a. At Console

(1)	Unit Type	- Manual, with either integral or separate tone arm.
(2)	Playing Speeds	- 33-1/3, 45, 78 rpm
(3)	Motor	- 4-pole induction, or hysteresis-synchronous type
(4)	Turntable	- 12" diameter; weight, 5 pounds or more.
(5)	Turntable Assembly Mounting	- Spring mounting, or other suitable means of isolation from external vibration.
(6)	Flutter and Wow	- 0.2% RMS
(7)	Rumble	- 50 db below average recording level
(8)	Cartridge Type	- Magnetic with proper compatible preamplification
(9)	Stylus (Needle)	- 1-mil (or less) diamond for 33-1/3 and 45 rpm disks; 3-mil sapphire for 78 rpm disks
(10)	Vertical Stylus Force (Tracking Pressure)	- 4 to 6 grams

(11) Stylus Compliance - 2×10^{-6} cm/dyne. Higher compliance preferably

(12) Frequency Response - 100 - 8,500 cps ± 2 db

Cartridges of the type usually furnished as replacement units in low-cost, one-piece portable phonographs shall not be acceptable. The frequency-response characteristics of the cartridge and stylus combination shall be those of GE VR-2 turnover, or equal.

4. Earphone

a. The bid shall be accompanied by the following data pertaining to all proposed earphones:

(1) The original manufacturer's brand name and model number.

(2) A graph of expected performance, made with equipment and procedures conforming to the American Standards Association Publications Z24.9, 1949.

(a) This graph shall be to a scale which permits reading decibels ref. 1,000 cps to 0 db. Five db shall occupy no less than 3/8 inch.

(b) The horizontal scale shall readily accommodate readings from 20 - 20,000 cps, the vertical scale at least 60 db.

(3) A statement of the maximum sound pressure level attainable at 1,000 cps at no more than .5% total harmonic distortion, and the voltage required acress the stated impedance of the unit to produce that level.

b. Frequence Response, deviation shall be no greater than:

(1) For 100 to 8500 cps ± 5 db

(2) For 200 to 5000 cps ± 2 db

c. Cords shall be jacketed with either neoprene or vinyl plastic, or similar acceptable material. Coiled cords may be required if requested by user.

d. The unfastened length of cord shall be secured so as to prevent the earphone from striking the floor if dropped.

5. Microphone

a. The bid shall be accompanied by performance graphs pertaining to all proposed microphones same as specified for earphones above.

b. Console Microphone

(1) Type - Dynamic, ceramic, or crystal

(2) Frequency Response - 40-15,000 cps listed, 100-10,000 cps ± 5 db, generally rising characteristic.

(3) Distributional Characteristics - Cardioid or nondirectional

Impedance and output level shall be chosen to match the amplifier with which it is to be used. Performance shall be that of Astatic 330 Series or approved equal.

c. Student Microphone

(1) Type - Dynamic, ceramic, or crystal

(2) Frequency Response - 100-8,000 cps ± 5 db.

(3) Distributional Characteristics - Cardioid or unidirectional

Impedance and output level shall be chosen to match the amplifier with which it is to be used. Microphones of the type usually packaged with home-type tape recorders shall not be acceptable.

d. Cords shall be jacketed with either neoprene or vinyl plastic or similar acceptable material.

e. The unfastened length of cord shall be secured so as to prevent the microphone from striking the floor if dropped. (Combination set only.)

f. When requested in the invitation for bids a combination type earphone-microphone shall be furnished in lieu of the separate arrangement herein before specified; however, the performance requirements specified shall remain unchanged. Where the combination is supplied include a substantial metal hook screwed or bolted to the top rail of the left wing wall of each student position for securing the set when not in use.

VII. SPARE COMPONENTS AND ACCESSORIES

A. The invitation for bids will state which and how many of the following spare components and accessories are to be either included in the bid or quoted separately:

1. Console Tape Recorder
2. Student Tape Recorder
3. Student Amplifier
4. Earphone (Set)
5. Microphones
6. Earphone Cords with Plug Attached (Separate or combination)
7. Combination Headsets
8. 50 Empty Reels 7" Self-threading

VIII. OTHER EQUIPMENT, ACCESSORIES, AND SUPPLIES

A. SUPPLIES

The bid will include four 7-inch plastic reels with 1200 feet of 1.5 mil, 1/4 inch mylar tape on each reel plus one 7-inch plastic self-threading take-up reel for each student position. Other tape as well as splicers may be obtained direct from State Contract Certification #17.

B. BULK TAPE ERASER

The bid shall include one professional heavy duty bulk tape eraser for completely erasing 7 and 10 inch reels of magnetic tape. This eraser shall consist of a magnetic demagnetizing device built in a base, together with control switch. Vertical spindles shall be provided to hold the reels of tape in the correct position relative to the demagnetizing element. The tape reels may be rotated manually. It shall operate on 110 volt, 60 cycle AC. The eraser shall be Type 710 as manufactured by Aerovox Corporation, New Bedford, Massachusetts, or its acceptable equivalent.

C. SPARE PARTS

The bid shall include:

1. The price of modular constructed elements of the plug-in type such as student amplifiers.

2. The price of complete student recorders.

3. The vendor will be required to keep a stock of recorder mechanical parts on hand. A list and price of items to include all parts subject to wear such as idler wheels and belts will be included with the instruction books.

The amount of discount from the current published list price shall be submitted with bid and be firm for at least five (5) years from acceptance date.

IX. INTERPRETATION OF SPECIFICATIONS

Should any bidder be in doubt as to the meaning of any portion of these specifications, he shall submit his request for interpretation, in writing, to the Engineering Section of the Purchase and Contract Division, who will issue an interpretation in writing to all bidders. To receive consideration, such requests must be in the hands of the Engineering Section at least five (5) days prior to the date established for the bid opening.

X. GUARANTEE

The bidder is to deliver the system to the owner in first-class operating condition in every respect, and shall guarantee the apparatus, material, and workmanship for a period of twelve (12) months from the time the system is accepted by the owner. If, during this time any defects should develop which are attributed to defective materials, negligence or workmanship, the bidder shall furnish such new materials as are necessary and shall repair said defects as required to restore the system to good operating order at his own expense. He shall make these repairs promptly upon receipt of notice of such defects from the purchaser or his representative.

XI. INSPECTION, ACCEPTANCE, AND PAYMENT

When the installation has been in use for a period of thirty (30) days, as specified under IV. A. 8., the bidder shall request an acceptance inspection. Upon receipt of such request, the Division of Purchase and Contract will schedule the inspection as soon as it can be arranged to the convenience of all parties concerned.

If the results of this inspection reveal that the system has been installed in substantial compliance with the requirements of the specifications, acceptance can be made and payment authorized in full; however, if sufficient discrepancies are noted to warrant withholding acceptance, but if they are of a minor nature sufficient to permit satisfactory continued use of the system, conditional acceptance may be given and the purchaser may make payment in the amount of 85% of the contract for continued use of the laboratory, in which case, the bidder shall arrange with the purchaser a convenient time for clearing discrepancies and placing the installation in an acceptable condition.

A follow-up inspection will be conducted, arranged as specified above, and if the system is thus found to be in substantial compliance, acceptance can be made and payment in full will be authorized.

This specification shall, until revised or rescinded, apply to each future purchase and contract for the commodity described herein. Retain for future reference. Copies of State of North Carolina Specifications may be obtained from the Engineering Section, Purchase and Contract Division, Department of Administration, State of North Carolina, Administration Building, 116 West Jones Street, Raleigh, North Carolina 27603.

PART 3

APPENDIX A

TO

LANGUAGE LABORATORY SPECIFICATIONS

SUPPLEMENTARY REQUIREMENTS

FOR

LINE VOLTAGE SOURCE WIRING

I. SCOPE AND CONNECTING SOURCE

A. The scope shall include the panel board and breakers, any required disconnecting means, feeders, conduit system, branch circuit wiring and receptacles all as more fully specified hereinafter or as shown on any accompanying drawings.

B. Where the electrical connection is to an existing panel board, circuit protective devices shall be free of any other load. If, to meet this requirement, new protective devices are required and can be fitted into existing spare spaces in the panel, such devices shall be a type designed to fit and rated at 20 amperes.

C. Where the connection is to an adequate source but no spare protective devices or spaces are available, provide a surface mounted NLAB panel board with sufficient protective devices to meet the load requirements in the same room where the laboratory is to be installed. Connect to feeder conductors in gutter of existing panel using OZ type "T" cable taps with type "TC" cable tap covers. Taps to be same size as feeders. Extend feeder in most direct route to the new panel location.

D. Where capacity is unavailable at the closest panel source, provide a feeder protective device matching existing equipment where possible or a surface mounted separately enclosed breaker or switch adjacent to the nearest source of sufficient capacity - even though it means locating adjacent to the main entrance service for the building. Feeder from this source shall supply a panel in the laboratory area as specified under C., above.

II. INSTALLATION

All wiring, unless indicated otherwise, shall be installed exposed in rigid conduit or metallic tubing, hot dipped galvanized, zinc metallized, or sherardized. Runs shall generally parallel walls and near ceilings and shall be adequately supported approximately 6 feet on centers, and at changes in direction using approved one hole or U clamps secured with lead expansion shields and bolts, Tampins, or similar approved devices. If EMT is used it shall be assembled with hex nut, threaded, compression type connectors. The equipment ground shall be maintained continuous, in any case.

Generally, feeder wiring #8 AWG and larger shall be type RH and branch circuit wiring, #10 and 12 AWG, shall be type TW 600 volt insulated. Joints, taps and splices in feeder conductors #8 AWG and larger shall be made using mechanical means and in branch circuit conductors #10 and #12 AWG shall be made by soldering, using a non-corrosive flux by the hot dip method. All connections shall be

electrically and mechanically secure and installed equal to or exceeding the conductor capacity in each instance. Taps, splices, joints and any other sections of wiring requiring taping shall be taped with at least two layers of approved gum rubber tape laid on with one half lap followed by at least one layer of friction or plastic tape similarly applied.

III. OUTLET BOXES

Outlet boxes shall be installed in a rigid manner using wood screws on wood, expansion shields on concrete or masonry or machine screws on metal work. Outlet boxes shall be one piece, stamped, galvanized, of code gauge sheet metal, with appropriate knockouts, size 1-7/8" deep by 2-1/8" wide by 4" long with device mounting "ears" turned in. Covers shall be by the same manufacturer to match the device installed in the box. Blank covers shall be installed where no devices are in the boxes.

Pull boxes shall be of code gauge galvanized sheet metal - not less than minimum size recommended by the National Electrical Code. Boxes shall be finished with screw fastened covers. All pull boxes shall be located in an accessible manner.

IV. RECEPTACLES

All receptacles shall be of the duplex type, rated at 15 amperes, 125 volts and shall be grounding type, equal to Bryant, AH&H, or Hubbell No. 5242.

V. PANEL BOARD

New panel shall be located in the same area as the laboratory installation. The panel shall be surface mounted with NLAB type breakers, shall have main lugs only with solid neutral. The panel shall incorporate sufficient protective devices to meet the load requirement. If the minimum number of protective devices in the pan are in excess of load requirements then the minimum size panel will be furnished. The electrical characteristics of the panel selected shall match the characteristi of the electrical system in the building in which it will be installed.

VI. TESTS

All equipment shall be placed in operation and the electrical system shall be prov satisfactory for operation and free of defects. Any defects discovered shall be promptly corrected.

VII. INSPECTION

For installations at State institutions a State Electrical Inspection Certificate will be required from the contractor prior to authorization of final payment. The contractor shall notify the State Electrical Inspector that the work is ready for final inspection. No inspection fees are required nor shall any such fees be included in the bid.

For installations in public school units, the local electrical inspector shall provide the inspection certificate.

PART 4

FORM OF PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

_____

hereinafter called the "Principal" and _____

_____

a corporation incorporated under the laws of the State of _____

_____hereinafter called the "Surety", are held and firmly bound unto the _____in the full and just sum of _____

_____Dollars ($_____), lawful money of the United States of America, to be paid to the said _____

_____, its successors, or its assigns for which payment well and truly to be made and done we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents. Sealed with our seals and dated this _____day of _____A. D., 19_____.

WHEREAS, the above bonded "Principal" has entered into a contract with the said _____bearing the date of _____day of_____, 19_____. A copy of which said contract is incorporated herein by reference and is made a part hereof as if fully copied herein:

For the full and complete execution of work in connection with the Language Laboratory installation covered by the contract. Bid No._____.

NOW THEREFORE, the conditions of this obligation are such that the above bonded "Principal", as contractor, shall in all respects comply with the terms of the contract and conditions of said contract, and his, their, and its obli-

FORM OF PERFORMANCE BOND

gations thereunder, including the specifications and plans therein referred to and made part thereof, and such alteration as may be made in said specifications and plans as therein provided for, and shall well and truly, and in a manner satisfactory to the _____and the ___

_____

complete the work contracted for within the time stipulated in the contract and shall save harmless the _____from any expense incurred through the failure of said Contractor to complete the work as specified, and from any damage growing out of the carelessness of said contractor, or his, their or its servant, and from any liability for payment of wages or salaries due or for material furnished said Contractor, and shall well and truly pay all and every person furnishing material, or performing labor in and about the construction of said improvement work, all and every sum or sums of money due him, them, or any of them, for all such labor and materials for which the Contractor is liable; and also shall save and keep harmless the said _____against and from all losses to it from any cause whatever, including patent, trademark and copyright infringements in the manner of constructing said project, then this obligation shall be void, or otherwise to be and remain in full force and virtue.

Provided, however, that no suit, action or proceeding by reason of any default whatever shall be brought on this Bond after twelve (12) months from the day on which the final payment under the Contract falls due.

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And provided further the said surety, for value received, hereby stipulates and agrees that no change, extension of time, alterations or addition to the terms of Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way effect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

This obligation shall remain in full force and effect until the performance of all convenants, terms, and conditions herein stipulated, and after such performance it shall become null and void.

IN TESTIMONY WHEREOF witness the hands and seals of the parties hereto on this _____ day of _____ 19_____.

Executed in _____ counterparts.

_____ _____
(Witness as to Contractor) (Contractor)

By _____

_____ _____
(Witness as to Surety) (Surety Company)

Countersigned: By _____

_____
(Licensed Resident Agent)